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Research Institute SOM
Faculty of Economics & Business
University of Groningen

Visiting address:
Nettelbosje 2
9747 AE Groningen
The Netherlands

Postal address:
P.O. Box 800
9700 AV Groningen
The Netherlands

T +31 50 363 9090/3815

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Michiel Gerritse
University of Groningen, Faculty of Economics and Business, Department of Global Economics and Management
Michiel.gerritse@rug.nl

Does trade cause institutional change? Evidence from countries south of the Suez canal*

MICHIEL GERRITSE†
University of Groningen

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Abstract

Does trade improve institutions? Theoretically, the effect can go either way: sectoral specialization may undermine institutions, but increased market access improves them. To examine the effect empirically, I exploit the 1967-1975 war-induced closing of the Suez channel as a quasi-natural experiment for freight cost changes. A difference-in-difference analysis shows that countries south of the Suez canal exported fewer products that rely on high-quality institutions when the canal was closed. This suggests that institutions suffered from trade isolation.

Keywords: institutions, trade, long run development, quasi-natural experiment
JEL-codes: O19; F63; N77; F11; F12; O43; F43

1 Introduction

In 1303, Edward I signed the Carta Mercatoria to protect foreign merchants, including the Hanseatic league, under English law. The Carta Mercatoria limited trade duties and proposed "firm and immutable" contracting, so that "neither merchant party to a contract can dispute it or back out of it." Edward was probably unaware of the trouble he caused his great-great grandson, Henry IV. By 1447, London merchants were powerful enough to protest the legal status and trade privileges of their Hanseatic competitors. Pressured, Henry IV revoked the concessions that his great-great grandfather granted to the Hanse. The repeal of the concessions led to hijacking of ships and the plundering of the Hanseatic trade offices in London, and eventually, naval war. English-Hanseatic trade required common contracting and legal definitions, but the point of this example, and the point of this paper, is that trade developments may also change those institutions.

The interest in institutional effects of trade is not only academic. Trade can have large indirect effects on long-run development, by causing institutional change (Rodrik et al., 2004). In popular discourse, international trade has two faces. Some consider market access, integration and easier capital mobility as key ingredients for long-run development. The "aid for trade" programmes pioneered by the World Trade Organization advocate development through international trade, for instance by advocating infrastructure investments. "Aid for trade" is now a mainstay of European Union development programmes and finds support by organizations like the UN and the OECD (OECD/WTO, 2013). In

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†Faculty of Economics and Business, University of Groningen. Nettelbosje 2, 9747 AE Groningen, The Netherlands. *email: michiel.gerritse@rug.nl, tel: +31 (0)50 363 5995.*

the US, the United States Trade and Development Agency partners pairs the promotion of exports with development aid. In 2013, the UK government concluded that "ultimately, trade is the most important driver of growth".[1] On the other hand, others see dangers of trade flows and multinationals entering poorer countries. Exposure to the larger world economy could prevent efficient government interventions or erode democratic decision making (Stiglitz, 2003; Rodrik, 2011). Anti-globalization lobbies point to lack of development effects and incompatability of growth programmes with local context (e.g., Bhagwati, 2002; Scott, 1997); and many NGOs oppose the trade-advocating programmes that they consider unethical (Oxfam amongst others).

History provides plenty of examples to suggest that international trade can fortify institutions. Freeing up to trade has improved contract enforcement, increased the accountability of trade partners, or restricted powerful elites. Puga and Trefler (2014) show that the growth of long-distance trade enabled Venetian merchants to constrain the Doge. The access to trading routes to the East empowered merchants to set up a parliament and improve contracting institutions. Greif (1989) shows how trade in the Mediterranean encouraged traders to set up institutions to deal with distant trade partners. In Europe, rising trade and the desire to protect non-local merchants' interests led to improved property rights formulated in Merchant Law (Greif et al., 1994). Acemoglu et al. (2005) contend that merchants' increased wealth derived from Atlantic trade was crucial in limiting European monarchical power, at least in those countries where trade benefited merchants more than monarchs. Jha (2013) argues that medieval Muslim long-distance shipping to India initiated institutions to trade across Muslim and Hindu ethnic groups, and shows that these institutions persist to reduce conflict in Indian cities today.

More recent empirical results lean towards beneficial institutional effects of trade, although the evidence is mixed. Trade and law enforcement correlate (Ades and di Tella, 1999), but it is difficult to establish whether trade improves institutions, or vice versa. The causality is unclear, because institutions like property rights and financing constructions also cultivate trade (de Groot et al., 2004; Nunn and Trefler, 2013), or there may be a cause that explains both. Exploiting variation from physical geography between countries (Frankel and Romer, 1999), Rodrik et al. (2004) find that trade openness causes better institutions. However, using the same instrument, Levchenko (2013) shows that trade may lead to poorer institutions if it occurs in sectors that are less sensitive to good institutions. Moreover, the geography between countries (e.g. distance) might correlate to alternative explanations like shared history or information flows; and it might have little explanatory power over and above local geography (Rodriguez and Rodrik, 2001; Irwin and Tervio, 2002). Giavazzi and Tabellini (2005) and Tavares (2007) show that episodes of trade liberalization are associated with better institutions, but it is hard to exclude that trade follows (or anticipates) good institutions, or that economic development or political change improves both.

This paper shows that theoretically, international trade can improve institutions, but will not necessarily do so. Earlier results suggest that trade erodes institutions in less developed countries. When trading with institutionally advanced countries, lagging countries specialize in industries that are less institutionally intense, increasing the local demand for easy expropriation. By incorporating a comparative advantage motive for trade, this paper obtains similar results. In this sense, my paper is mostly related to Levchenko (2007). It also follows the conjecture of Nunn and Trefler (2013) that comparative advantage (rather than trade openness per se) explains institutional quality. However, this paper explores the effects of the overall size of the trade flow as well. In the theoretical illustration below, entrepreneurs need up front, expropriable investments to produce. Poorer institutions lead to larger obstacles in attracting production factors, raising factor prices. The ensuing increase in the final goods price leads to lower sales. The disciplining effect of lost sales becomes stronger when access to foreign

[1] Secretary of State for International Development Greening in July, 2013 (see https://www.gov.uk/government/speeches/justine-greening-global-trade-can-help-us-end-the-need-for-aid).

markets is easier, in which case lowering prices yields larger revenues. As a result, trade liberalization could push all firms to demand better property rights, to prevent inducing risk premia that hamper sales. This beneficial channel could counter the negative, sectoral effects. While comparable arguments have been made implicitly in the public debate, this paper is among the first to formalize such a beneficial channel. Do and Levchenko (2009) follow a related argument, but they compare poorer institutions to higher entry costs. Productive, larger firms prefer higher levels of entry costs, and trade liberalization may improve or worsen institutions, depending on how it affects the share of largest firms. Dixit (2003) similarly, but inversely, shows that larger markets require more formal property rights for enforcement.[2]

This paper documents that export growth following trade isolation is lower for the sectors that depend on institutions. The sectoral dependence on institutions follows Nunn (2007), who shows that contract enforcement is a source of comparative advantage. The approach of the current paper was inspired by an essay of Fernando Ortíz of 1940, explaining how on Cuba, the production of tobacco takes time but little manpower, whereas sugar grows fast and is harvested at great scale using laborers intensively. The production method differences caused tobacco to be "liberal, not to say revolutionary", while sugar is "conservative, if not reactionary".[3] This paper exploits sector differences in institutional sensitivity only for identification. It is related to literature that traces long-run development from sectoral structure although it is less ambitious (in that this paper only looks at institutions, not overall development). Sokoloff and Engerman (2000) argue that sectoral and institutional developments are linked historically: in countries suited to sectors with scale-intensive production, like sugar or cotton, colonizers developed larger inequalities and less inclusive institutions as a result. Countries that fostered smaller scale production (like grains), like the U.S. and Canada, saw institutions that enabled faster long-run development. In the same vein, Bruhn and Gallego (2012) show that long-run development coincides with historical regional specialization into constant-return and increasing-return sectors. Dippel et al. (2015) document that falling sugar prices reduced the coercive power of plantation owners in the 19th century British Carribean. Mayshar et al. (2015) similarly show that soil suitability for storable crops generates demand for protection from expropriation, because storable crops are most easily expropriated.

To contribute to the debate whether trade *causes* institutional change, I exploit the closing of the Suez canal as an exogenous shock to trade openness and examine its effect on sectoral export patterns. An Egyptian-Israeli war closed off the Suez canal completely, cutting off countries behind the Suez canal from a quick route into the Mediterranean - the experiment was proposed by Feyrer (2009). In the three years before and after the canal shutdown, there are substantial trade adjustments. The export of beef, which requires large up front investments, grew around 15% slower in countries whose shortest route was through the Suez canal, compared to other countries. The export of hogs, by contrast, requires far less up front investments. In countries south of the Suez canal, exports of pork grew around 37% faster than elsewhere. The approach of comparing the trade shock in different sectoral exports, echoing Rajan and Zingales (1998), uses an indirect measure of institutions. Yet, it yields two merits. First, the analysis does not rely on institutional indexes, which are available for limited time frames only. In particular, it allows exploiting a quasi-experiment at a time and place where institutions were not quantified: African countries behind the Suez canal did not anticipate, let alone influence the closing of this canal. Second, comparing between sectors in the same country allows ruling out many country-level confounding effects like recessions, political responses or exchange rate developments. Ruling out alternative explanations, the analysis complements attempts to establish causal effects of trade through

[2]Some other papers suggest that skill demand developments induced by trade liberalization change the rate of expropriation (Ghosh and Robertson, 2012), and that trade may draw away labor from conflicts that require labor (dal Bó and dal Bó, 2011).

[3]As quoted in Tom Miller's "Trading with the Enemy".

cross-country instrumental variable evidence and difference-in-difference evidence.

The results suggest that closing down trade hurts domestic institutional quality. Conversely, opening up the Suez canal expanded export sectors in Eastern Africa that rely on institutions intensively. This holds for different definitions of institutional intensity. I also find modest evidence for shifts away from capital-intensive sectors in Eastern African countries when trade costs are lower. This points to comparative advantage dynamics, which do not reverse the beneficial institutional effects of trade.

The next section develops the theoretical argument in which institutional quality in the outcome of a political process. Its main point is that comparative advantage forces may produce a detrimental institutional effect of trade liberalization, but an incentive to avoid the high production costs associated with poor institutions can overturn the detrimental effects. Section 3 presents the data, examines the trade shock, and the empirical results. Section four concludes.

2 Theoretical motivation

This section develops a model of international trade, in which property rights are endogenously determined through interest groups. The main idea in the model is that trade liberalization expands the sectors that have prices that are low relative to world prices (i.e. in which the home country has a comparative advantage). If this occurs in sectors that do not need good institutions, then the base of bribers for poor institutions grows. On the other hand, as sectors are not perfectly competitive, lower marginal costs better help exploit large market access. Low marginal costs, especially for attracting capital, depend on the quality of institutions. As a result, producers may put less effort into deteriorating institutions when the economy is more open.

This model implies a tradeoff between potentially adverse specialization from trade liberalization, and overall benefits from trade openness. The latter "enlightening" trade effect is novel. Related arguments for adverse specialization have been made before. A difference in this paper is that the contracting friction is in the up-front investment. That implies that factor prices for factors that can be expropriated are not constant, but command risk premia.

The model of intersectoral international trade with imperfect competition builds on Helpman and Krugman (1985) and Arnold (2013); and Bernard et al. (2007). The formulation of institutions follows a Grossman-Moore-Hart formulation, as also studied in endogenous trade policy (Ornelas, 2005) and endogenous institutions (Levchenko, 2007). In short, capital owners lose some of their capital in production due to ill defined property rights, so capital is interpreted as the institution-intensive factor. Firms owners have incentive to bribe policymakers into imperfect institutions. This section first discusses the transaction between firms and suppliers of capital, which is interpreted as the institution-intensive factor. The section subsequently develops an open-economy model.

2.1 Institutions and production factors

To consider the consequences of imperfect institutions, I allow for frictions when contracting a production factor. In this case, capital owners supply a firm with capital, a catch-all term for production factors that need to be transferred to the firm and are at risk of expropriation. In the following, the firm needs to install some capital up front in its production process, making it relation–specific. The capital may take the form of machines, but also of intellectual property or human capital. In essence, the firm rationally expropriates as much of the capital as it can at the end of the production process, so capital owners require a premium on returns. As the firm and the capital owner bargain over the surplus of the investment, reducing the quality of contract enforcement may lower total capital costs for the firm, but raise the marginal costs of using capital.

Poor property rights imply that the firm can expropriate share ϕ (following the notation of Levchenko (2007)) of the capital used in the fixed stage of production. A higher ϕ implies that contracting is more difficult: the property rights over a larger share of capital cannot be established; or the contract cannot be enforced easily. An important assumption here is that the capital involved in up-front investments is more vulnerable to poor institutions than inputs in the variable stage of production. One justification is that this capital is typically involved in the entire production process - the machines adapted to a firm, the payments for buildings, or the knowledge embodied in human capital are required before revenue enters the firm's accounts. Moreover, inputs involved in the variable stage of production (inputs required for each product, assembly) can be withdrawn for subsequent units if the firm renegotiates the contract. Thus, punishment strategies may be more feasible for inputs in the variable stage of production.

To agree on the transfer of capital, a firm and a capital supplier bargain over a rate of return r on capital. The firm is able to expropriate share ϕ of the up-front (fixed) stage capital. The cost of capital for the firm are $k_q r + k_f r (1 - \phi)$, where k_q refers is the capital used in the variable stage of production and k_f is the capital used in the fixed stage; k_q and k_f sum up to k. The alternative option for the firm is to write a fully specified contract, which commits the firm to not expropriating. Writing the contract is costly, however, because it requires full documentation and contingency planning. As a result, the cost of attracting a unit of capital is higher under full contracting: $\bar{r} > r$ (or the costs of perfect contracting are prohibitive in equilibrium). For the supplier, the returns are the agreed return over the total capital stock, kr, but ϕk_f will be expropriated with certainty. The alternative option for the supplier is a risk-adjusted investment return elsewhere in the economy. I assume that the return on the capital supplier's outside option r^* falls in the overall quality of contracting ϕ, because poor contracting reduces the risk-adjusted return (or the demand for risk-free investment rises, reducing the risk-free return). The outside option needs to pay off less than the contract: $r > r^*$ (the supplier's participation constraint). The firm and capital supplier Nash-bargain over the surplus, as is convention (see, e.g. Maskin and Tirole, 1999). In equilibrium, the surplus from the transaction is equally shared, so the contract return solves that the surplus of the firm and capital supplier are equal:

$$-(k_q r + k_f r (1 - \phi) - k\bar{r}) = kr - \phi k_f r - kr^* (\phi), \tag{1}$$

where the left-hand side is (the negative of) the firm 's total cost under the transaction less the total costs of perfect contracting; the right-hand side is the supplier's revenue less the revenue from an outside option.

The rate of return that solves the bargaining problem is:

$$r = \frac{1}{2} \frac{(r^* (\phi) + \bar{r})}{1 - \phi k_f / k}. \tag{2}$$

If there were no expropriation ($\phi = 0$), the equilibrium return would be the average of the firm's and supplier's outside options. Poor contracting, however, increases the price capital, because the supplier requires compensation for the expected expropriation. That compensation is larger, if the share of capital used in the fixed stage of production is larger. At the same time, poorer contracting reduces the alternative, risk-adjusted return for the capital supplier. As a result, the required return falls. The increased expropriation is thus countered with worsening outside options for the capital supplier, so the effect of worsening institutions on equilibrium returns is ambiguous:

$$\frac{dr}{d\phi} = r \left(\frac{k_f / k}{1 - \phi k_f / k} + \frac{dr^* (\phi) / d\phi}{r^* (\phi)} \frac{1}{(1 + \bar{r} / r^*)} \right) \gtrless 0 \tag{3}$$

Poorer institutions may depress capital returns if the value of the investor outside option declines faster than the risk premium rises. For the purpose of the analysis, I assume that the risk-premium effect dominates (which also seems sensible if the outside option is a weighted average of returns across the economy). Theoretically, the results can be reversed if poorer institutions reduce equilibrium capital returns - in that case, bad contract enforcement is a comparative advantage because it lowers marginal costs.

The firm's total capital costs are $TKC = r\left(k - \phi k_f\right)$. For a given level of capital, a change in the quality of institutions, ϕ, has two effects on total costs: it increases the share of capital expropriated and thus not being paid for; and it raises the equilibrium return on capital. Differentiating the total costs function and using the derivative of returns with respect to ϕ gives:

$$\frac{dTKC}{d\phi} = \frac{dr^*\left(\phi\right)/d\phi}{r^*\left(\phi\right) + \bar{r}} r^* \left(k - \phi k_f\right) < 0.$$

The total costs for the firm are lower if contract enforcement is poorer. The expropriation is foreseen and factored into the price of capital. However, as the outside option for the capital supplier deteriorates, he secures less of the surplus of the transaction, and the total costs for the firm fall.

The imperfect contract in this model effectively requires a relation-specific investment, as the capital supplier realizes a share of his initial capital is not retrievable. In that sense, there is a parallel with other property rights models (Aghion et al., 2004; Noeldeke and Schmidt, 1998). Maskin and Tirole (1999) show that the contracting problem is much like bilateral monopoly models (Hart and Moore, 1988), where a hold up situation emerges from the partner-specific investments. The essence of the argument is that the incomplete enforcement of contracts yields an advantage for the firm that has hold of the institution-intensive capital. In the trade model below, there is a second distortion (monopolistic competition) which raises output prices. The contracting imperfection leads to a transfer (the expropriable part of capital) and a capital return distortion. As long as the capital returns are increased by the contracting friction, they will reinforce the monopolistic price distortion, so the imperfect contracts are likely to reduce welfare.[4]

2.2 The trade model

To study how international trade can change institutions, I embed the problems that arise with imperfect contracting in a small country opening up to world trade. There are many sectors and each sector is populated with many firms.

Imperfect competition helps to explain two questions that a model of perfect competition cannot. First, even in African agriculture, there are substantial markups (especially for risky crops, see discussion below) and fixed costs. These cannot be consistently adressed in most perfect competition frameworks. Second, a framework with fixed costs may be more informative of institutional developments than marginal costs. The reason is that when trade costs change, marginal costs may reflect institutional risk in the factor market, but the implied output price change reflect also Stolper-Samuelson movements. Fixed costs do not end up in the relative output price.[5]

Firms use labor (l), capital (k) and sector-specific resources e. The sector-specific resources can be

[4] In the theoretical case where poor contract enforcement depresses capital returns, poor institutions may effectively bring output prices closer to the optimal price. In that case, imperfect enforcement can be part of a second-best solution.

[5] In a perfectly competitive setting, one could introduce bargaining over the capital returns, where all capital is expropriable and there are no fixed costs. The equilibrium capital return is

$$r = \frac{1}{2}\frac{r^*\left(\phi\right) + \bar{r}}{1 + \phi}$$

instead of (2). This leads to similar results but assumes away a role for fixed costs.

thought of as land (expressed in productivity terms), natural advantages or infrastructure specific to a sector. The production function is $q = q(l, k, e)$. The price of labor, capital and the sector-specific factor are w, r, and ρ, respectively. All production factors are necessary but have decreasing returns.[6] The country's endowment of the sector-specific production factor is E_z. With n_z symmetric firms operating in sector z, the use of the endowment per firm is E_z/n_z. The equilibrium price of the sector-specific factor is determined by its inverse use: $\rho = \rho(n_z/E_z)$. Firms and capital suppliers negotiate the return on capital r_z. Labor is mobile across sectors, and wages equalize across sectors. To pin down the equilibrium, I take the wage rate as numéraire, $w = 1$.

The marginal costs of the firms depend on the price of the endowment, capital returns, and the technology of the sector: $mc_z = mc_z(r_z, n_z/E_z)$. If capital rates rise, so do the marginal costs of production. The capital intensity of (marginal) production is higher, if the marginal costs of production rise faster with capital prices (higher dmc_z/dr_z indicates higher capital intensity).

Consumers view goods within a sector as imperfect substitutes. The preference over different sectors is unit-elastic. The consumers' utility function is:

$$U = \int b_z \ln C_z dx; \quad C_z = \left[\int_{i\in z} c_i^{(\sigma-1)/\sigma} di\right]^{\sigma/(\sigma-1)},$$

where b_z is effectively the budget share for industry z, and i indexes individual firms. For a representative consumer, the demand function is:

$$c_i = \frac{\bar{p}_i^{-\sigma}}{\int_{i\in z} \bar{p}_i^{1-\sigma} di} b_z y, \tag{4}$$

where y denotes the income and the bar over p indicates delivered prices. For further reference, I use the harmonized price index of a sector as $P_z = \left[\int_{i\in z} \bar{p}_i^{1-\sigma} di\right]^{1/(1-\sigma)}$. Facing the iso-elastic demand function, markup pricing is optimal for the firm:

$$p_i = \frac{\sigma}{\sigma - 1} mc_z. \tag{5}$$

Output prices are proportional to marginal costs. When shipping to a foreign country, the firm faces iceberg transport costs: it needs to ship τ units for one unit to arrive. Under constant elasticity of demand, the firm charges a premium for the trade costs to foreign consumers, so the delivered price in a foreign country is $\bar{p} = \frac{\sigma}{\sigma-1}\tau mc_z$.

In equilibrium, firms export to the foreign country from the small home country. The firm's profit function consists of revenue less costs for all production factors and any political contributions the might make, ω_i. The profit is:

$$\pi_i = (\tau p_i)^{1-\sigma} \frac{b_z Y}{P_z^{1-\sigma}} - TKC_i - \rho_z e_i - l_i - \omega. \tag{6}$$

Firms enter as long as the profits are positive, increasing the number of firms in sector z. In equilibrium, $\pi_i = 0$ and $d\pi_z/dn_z < 0$.

The trading equilibrium is further determined by four other equilibrium conditions: the markets for labor, endowments, and capital clear, and trade with the outside world is balanced. Equilibria of this type are discussed in Helpman and Krugman (1985, chapter 7) and Arnold (2013). The most notable difference is that in my framework, the Inada conditions on the sector-specific production factor ensure that firms in a specific sector become extremely productive if their number tends to zero. As a result,

[6] I.e. $dq/dx > 0$; $d^2q/dx^2 < 0$; $\lim_{x\to 0^+} dq(x, x^- > 0)/dx \to \infty$; where x is k, l, e and x^- are the production factors not x.

all sectors are active, whereas in the traditional Heckscher-Ohlin world with imperfect competition, countries may specialize fully into a subset of sectors. This resembles the Bernard et al. (2007) model of comparative advantage with heterogeneous firms, where very productive firms are able to survive in comparative disadvantage sectors. Mechanically, the models are similar in this prediction, except the the motivation in the current model is Ricardian.

2.3 Politics

The level of institutional quality is determined by a policy maker. I assume that the beneficiaries of poor property rights can send political contributions to the policymaker to make him change the level of contract enforcement. I follow Levchenko (2007) in assuming that there is a single policymaker that is sensitive to political bribes. The policymaker has a desire to minimize losses to social welfare, which could be motivated by electoral or ethical reasons. The policymaker uses the political contributions to finance private consumption of foreign goods. An alternative interpretation of the policymaker could be a political elite. Its motivation to maintain welfare could be to avoid unrest or forceful threats to the elite (as underlies the coup or conflict models in, e.g., Acemoglu and Robinson, 2006). The theory below does not consider repressive politics, however, so the latter interpretation is less intimately linked to the theory.

The policymaker of the country has two objectives: political contributions (or bribes), and social welfare. The relative weight λ determines how much funds are needed to make the policymaker worsen contract enforcement. That susceptibility to bribes λ can be interpreted as the elite's preferences or the constitutional environment, for instance. Weaker contract enforcement, as argued above, is generally harmful to social welfare. Using S to denote welfare and Ω to denote the sum of political contributions, the political objective function is:

$$G = \lambda S(\phi) + (1-\lambda)\Omega \tag{7}$$

If $\lambda = 1$, the policymaker is perfectly benevolent. If λ is smaller than 1, the policymaker is increasingly corrupt. I assume that the policymaker can can freely choose the quality of property rights (i.e. no explicit law enforcement sector is modeled) - bribes are the only reason to prevent him from developing optimal institutions (for which $dS/d\phi = 0$).

The first-order condition for the policymaker implies that:

$$-\frac{\lambda}{1-\lambda}\frac{dS}{d\phi} = \frac{d\Omega}{d\phi}. \tag{8}$$

The social costs of deteriorating institutions poor institutions weigh against the benefits of political contributions. The rate at which the marginal social costs are weighed against financial contributions is higher if the policymaker is less corrupt (λ is higher). The degree to which the policymaker permits expropriation by firms is simply determined by the amount of contributions he receives, so (8) provides a measure of the institutional quality. Consequently, the effects of trade liberalization on property rights are determined by how trade liberalization changes the incentive to bribe the policymakers.

It is left to determine how firms decide on the level of their contributions. I assume that firms have common lobbies influence to policymaker. As individual firms are atomistically small, their individual contributions have ignorable effects on the policymaker's decisions. It is important to note that firms have no such monopolistic power in output market. This assumption seems sensible when the country is small - there is no collusion with firms of the same nationality on the world market.[7]

Firms bribe to establish their preferred quality of institutions, realizing that their preferred quality of institutions implies a specific contribution. Maximizing the profit function with respect to the level

[7] If the country is large, strategic behavior on the world market substantially complicates the model.

of institutions, the first-order condition is:

$$\frac{d\omega}{d\phi} = (1-\sigma) R_i \frac{dmc_z/dr_z}{mc_z} \frac{dr_z}{d\phi} - \frac{dTKC_i}{d\phi}, \tag{9}$$

where $R = (p/P)^{1-\sigma} b_z Y$ is the firm's revenue. The left-hand side of this first-order condition is the change in required contributions when the level of contract enforcement changes. The right-hand side of this first-order condition is the net effect on sales less factor costs. It is the balance of two effects. First, poorer institutions increase the marginal costs, thus reducing sales ($\sigma > 1$). This effect is weighed by the capital intensity of production (the degree to which capital price increases imply higher marginal costs, dmc_z/dr_z). Second, as shown above, poorer contract enforcement reduce total costs for capital, which benefits the firm. In both cases, the benefits in terms of profits are lower for firms that have higher fixed capital requirements: their marginal costs rise faster and their total capital costs reduce less quickly when institutions deteriorate. Summarizing, the willingness to bribe $d\omega/d\phi$ is lower for industries that face larger fixed costs, and for capital intensive firms, assuming that poor contract enforcement raises marginal costs.

2.4 The institutional effects of trade liberalization

The effects of trade liberalization in this trade model are best summarized as two forces: market access grows and comparatively advantaged industries grow. The two forces have opposing effects on the firms that send contributions.

The total political contributions Ω can be split into sectoral parts: $\Omega = \Sigma_z n_z \omega_z$, where ω_z is the profit-maximizing contribution of a typical firm in sector z. The change in institutions ϕ leads to changes in sectoral distribution and in the chosen levels of contribution. The degree of permitted expropriation is determined by:

$$\frac{d\Omega}{d\phi} = \sum_z \left(n_z \frac{d\omega_z}{d\phi} + \frac{dn_z}{d\phi} \omega_z \right). \tag{10}$$

From the policymaker's first-order condition (8), expression (10) equals the violations of social welfare due to imperfect contract enforcement. Whether the policymaker improves contract enforcement after trade liberalization depends on how trade liberalization affects the profits of firms paying the contributions. Since the left-hand side of (10) is a direct measure of the (lack of) contract enforcement, the effect of trade costs on institutions is its cross-derivative with respect to trade costs: $d^2\Omega/(d\phi d\tau)$. The derivation of this effect is delegated to the analytical Appendix. However, the intuition for the force that trade costs exert on expropriation is intuitive, and consists of two parts:

$$\frac{d^2\Omega}{d\phi d\tau} = \sum_z \left(\underbrace{(1-\sigma) \frac{dmc_z/d\phi}{mc_z} \frac{n_z dR_z}{d\tau}}_{1} + \underbrace{\frac{dn_z}{d\tau} \frac{d\omega_z}{d\phi} - \frac{dTKC_i}{d\phi} n_z \frac{dk_i/d\tau}{k_i}}_{2} \right). \tag{11}$$

The first effect in the bribe sensitivity to trade costs (11) suggests that trade liberalization improves institutions. Poor institutions raise marginal costs in any industry, so $dmc/d\phi$ is positive in any case. A decrease in trade costs increases revenue R, because market access improves. In that case, having high marginal costs is penalized further: the benefits of expropriation now need to compensate an increased loss of sales revenue following high output prices.

The second effect in (11) comprises two comparative advantage forces. Some industries expand in firm numbers with trade liberalization. Firms in different sectors prefer different levels of institutional quality, so sectoral reallocation changes the demand for low-quality institutions. If the correlation be-

tween $dn_z/d\tau$ and $d\omega_z/d\phi$ is negative, the sectoral reallocation effect yields poorer institutions. In particular, as industries with lower fixed costs prefer easier expropriation, trade liberalization might deteriorate the institutions in countries where institutions are poorer than elsewhere. The sectoral expansion ($dn_z/d\tau$) is further detailed in the analytical Appendix. This mechanism is parallel to the one outlined in Levchenko (2007). There is an effect on capital use of firms within sectors, too. This is captured in $\frac{dTKC_i}{d\phi} n_z \frac{dk_i/d\tau}{k_i}$. Trade liberalization causes Rybczynski capital intensity changes ($dk_i/d\tau$) at the firm level i. Whether these fall to high-quality or low-quality demanding sectors, determines whether the demand for good institutions rises. It is not clear-cut whether trade liberalization actually expands low- or high fixed costs sectors: that is determined by overall capital intensity, not fixed capital investments. A positive correlation between capital intensity and upfront costs could reinforce the comparative advantage effects on institutions: then, a labor-abundant economy sees expansion in the sectors with low upfront costs after trade liberalization.

The trade model with imperfect competition thus predicts that the institutional effect of trade liberalization is the sum of two (opposing) forces. Firstly, trade liberalization enlarges the market, and in a larger market, low marginal costs are important. Thus, easier goods trade provides an incentive to get rid of institutional factors that drive up factor prices. On the other hand, trade liberalization may cause countries to specialize in their comparative advantage industries. In a country with poor institutions and abundant labor, those might be the industries that thrive with poorer institutions: trade liberalization could mean an extra barrier to high levels of contract enforcement.

2.5 To the data

The above discussion motivates the empirical analysis. The model suggests that sectoral exports change directly with a trade cost shock through the costs of supplying foreign markets; and indirecly through transport costs, and indirectly through changes in equilibrium institutions:

$$\frac{dn_z R_z}{d\tau} = \frac{\partial n_z R_z}{\partial \tau} + \frac{\partial n_z R_z}{\partial \phi} \frac{d\phi}{d\tau}. \tag{12}$$

The export equation is a standard "gravity" prediction obtained from aggregating individual demand (eq. 4). The direct effect of trade cost changes on exports, $\partial n_z R_z/\partial\tau$, is determined by the price of the sector's good relative to the world price (which can depend on the quality of institutions). The indirect effect is a product of a sector's sensitivity to institutions ($\partial n_z R_z/\partial\phi$) and the sensitivity of institutions to trade openness, $d\phi/d\tau$. The empirical specification below exploits that differential sensitivity to institutional quality; by checking whether the sectors that rely more on good institutions export more or less during trade isolation.

An important relation in the analysis, then, is the sensitivy of exports to institutional quality. In the model, it is:

$$\frac{dn_z R_z/d\phi}{n_z R_z} = -(\sigma - 1)\,\varepsilon_{mc,r} \left(\frac{k_f/k}{1 - \phi k_f/k} + \frac{dr^*(\phi)/d\phi}{r^*(\phi)} \frac{1}{(1 + \bar{r}/r^*)} \right), \tag{13}$$

which uses the capital returns (3) and the inelasticity of entry (the derivation is in the analytical Appendix). Poorer institutions reduce exports disproportionately in sectors where capital intensity is high, and where up front capital comprises a large part of the required capital.

When looking at the effects of trade isolation on exports of sectors with different institutional intensity, it is important to rule out the direct trade effects. The above equation excludes direct effects by focusing on the interaction effects between institutional sensitivity and the trade shock. I also check whether the interaction effect could be explained by alternative, correlated differential effects of characteristics like average traded distance of the product, trade costs, or overall capital intensity. However,

the sample offers a possibly more compelling argument. I assume that African countries in the 1960s and 1970s had no comparative advantage in institutional quality and were not capital abundant. The direct trade effect of trade isolation is to push African countries into sectors that do not rely on property rights and capital. If isolation improved institutions indirectly, the direct and indirect effect might be correlated (both predict growth in institutionally sensitive industries during the closure of the canal). Then the the trade effect might indistinguishable from the institutional effect. I find the opposite, however: trade patterns move opposite to what the direct channel predicts - institutionally sensitive sectors decline with trade isolation. Thus, institutionally intense sectors decline, even though demand for their products is higher.

3 Evidence from the closing of the Suez canal

The above discussion suggests that trade liberalization may cause opposing pressures on institutions. On the one hand, access to international market is overall beneficial as producers demand better institutions. On the other hand, the potential specialization in industries that rely less on good institutions may reduce the demand for high-quality institutions. This section evaluates the results empirically, describing the Suez canal as a "quasi-experiment" and discussing difference-in-difference evidence. The background on the Suez canal is kept to a minimum; a more extensive description of the events that led to the closing of the canal can be found in Feyrer (2009), who proposed the experiment.

It is important to understand, too, what the empirical model does not do. The above equations aim to provide a consistent story of institutional change, but rely on a specific channel of institutional change (through political contribution). The aim of this section is not to test that specific model, but to understand the net institutional effects of trade in this sample.

In this section, I show that sectors that require larger upfront costs and thus require good institutions, suffer more from trade isolation. This is not explained by the capital intensity of the sector or the possibility that sectors with large upfront costs have a different sensitivity to trade costs. I also show that, conditional on country fixed effects, institutionally weaker countries export less of the products that require upfront costs. Finally, I show similar results for different measures of institutional sensitivity.

3.1 The Suez canal and context of the trade shock

The Suez canal was shut from 1967 to 1975. In 1955, after the Egyptian approachement to the Soviets, the UK withdrew its financial support for the construction of the Aswan (high) dam and the US followed the next year, in 1956. In response, the Egyptian president Nasser nationalized the Suez canal, earlier held by the British, to finance the Aswan dam construction. To avert an Israeli (backed by the British and French) dispute with Egypt, the United Nations passed the Pearson resolution in 1956. The Pearson resolution left the Suez canal freely navigable under UN control. It was not until the Six Day war with Israel that Egypt closed the canal again. During the Six Day war, Israeli forces took control of the Sinai peninsula, leading the Suez canal to be a warfront. Egypt closed down the canal by sinking ships; and by the end of the war a substantial amount of mines had been placed in the canal. The closure of the canal was unexpected. In fact, a group of ships (the "Yellow Fleet") were caught in the canal after it had been closed, only to be released in 1975. In 1973, the canal was once again the scene of war, this time of the Yom Kippur war. By 1974, the UN had regained control over the Suez canal, but the wartime debris and mines still left the canal innavigable. After clearing the canal, it was formally reopened on June 5th, 1975.

The closing of the Suez canal poses a possible quasi-experiment for the countries south the Suez canal. Egypt was clearly involved in the conflict that led to the closing of the canal, but many coastal countries south of the canal were not involved in the conflict. Exporting many agricultural goods and resources, these countries have had clear transport cost shocks while other freight costs (air transport) remained fairly constant. Moreover, as argued in Feyrer (2009), the conflict broke out unexpectedly and continued over the closing spell, so the change in transport costs was not anticipated or avoidable.

To proxy the change in transports costs, I exploit the change in kilometers of sea navigation required for a set of African countries to reach a European port. For countries on the East coast of Africa, the closing of the Suez canal implied a shipping route around the South Cape. For countries on the West coast (that is, South Africa and countries located more West), shutting down the eastern route had no consequences for the shortest path. To quantify these changes, I have taken sea route data from searates.com (see Appendix), for shipping to the (then) largest part of Europe, Rotterdam. I compared the length of the route in kilometers via the Suez canal, and the route via South Africa.[8] The regressions use only countries that have access to the ocean, because for land-locked countries like Zambia or Uganda, it is uncertain whether the shortest route is affected. The Appendix provides a list of the African countries in the sample; and which ports I took to be their main seaport. Figure 1 summarizes the percentage change in shipping distance to Rotterdam. The mean distance to the port of Rotterdam before 1967 was around 10,600 kilometers. For the affected countries, the mean distance increased from 10,400 kilometers to 14,900 kilometers.

The closing of the Suez canal had substantial effects on trade. Feyrer (2009) documents that the closing of the Suez canal led to significant decreases in aggregate trade for country pairs whose quickest route used the canal. Focusing on agricultural exports, my main data, this picture is confirmed. Figure 2 traces the development of the (total) agricultural exports in my data for affected countries (for who the shipping distances increased in 1967, on the eastern coast of Africa) and unaffected countries. Affected countries show a drop in exports in 1967, moreover, high export growth experienced elsewhere on the continent was absent of the East coast. A simple difference in difference regression of the log of total exports on the interaction of dummies for being affected and for the years 1967-1975; and for country and time fixed effects confirms this: the interaction term takes a coefficient -0.11, suggesting that affected countries had 11% lower exports than could be expected if under the same circumstances as the unaffected countries. It is less certain which transporters were most affected. British registered ships traditionally account for the lion's share of merchant shipping (Jeula, 1872); but by 1966, Liberian, and Norwegian-registered ships took large portions too, due to the use of flags of convenience.[9] The British minister of Foreign office notes that from 1967 to 1968, the number of British ships calling at South African ports tripled.

The canal closure affected trade relations, but not many other relations. Passenger travel from Europe to the African countries in the sample did not become much slower, and news and other information is unlikely to be hampered by the barred searoutes. This reduces potential contamination of the causal effects of trade with the other effects of economic integration, which often correlate with distance, too.

The predictions of my model would be less likely to hold if there were no functioning (international) markets, or if production was fully planned in the sample countries during the years of my sample. However, there are several reasons to assume this is not a large problem. First, planning or

[8]The second route is the sum of two parts, shipping to South Africa, and subsequently shipping to Rotterdam. To infer the cost of the stop in South Africa, I compared the kilometers shipping from Mozambique to Botswana, to the kilometers shipping from Mozambique to South Africa to Botswana. The results do not change whether subtracting this "South Africa stopover" difference from the imputed length of the southern route. I also used the shipment time, but as it is highly correlated to the kilometers, the results do not change between using time or kilometers.

[9]The latter statistics stem from the leaflet "General Comparative Statistics: Panama and Suez Canals" that the Panama Canal museum published in 1971.

Figure 1: Shipping distance changes to Rotterdam (%) due to Suez channel closing by country

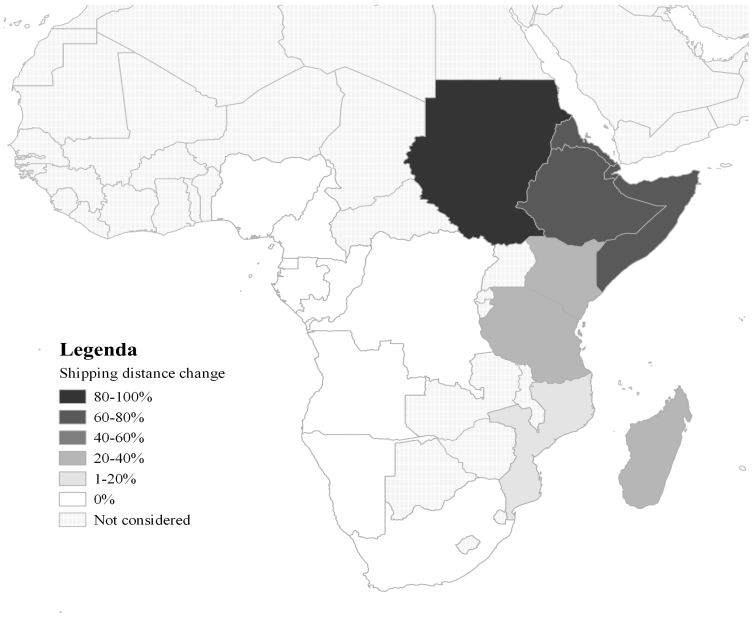
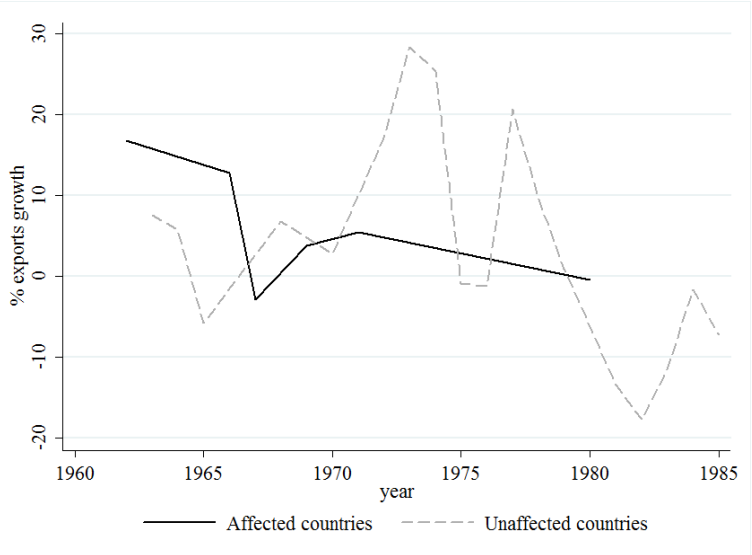


Figure 2: Evolution of agricultural trade for affected and non-affected countries



absence of markets would imply absence of the trade effects that are central to the model. A test using exports would thus be biased towards finding no conclusions, if trade were unresponsive to international markets. Second, I find modest evidence that capita-intensive industries thrive with the closure of the Suez canal - consistent with neoclassical trade theory. Third, while evidence is not abundant, most of it suggests that more or less functioning markets were present, despite relatively many government interventions and occasional extreme outcomes following droughts. There is evidence that workers choose to work in different industries according to pay and risk. Firing workers is not easy, but wages do reflect human capital and urban premia in many parts of Africa (Boissiere et al., 1985). Countries probably relied on tariffs and taxes on exporting industries, although that has not stopped trade - with the exception of Somalia, exports to OECD countries grew in sub-Saharan Africa (Dercon, 1993; Collier, 1991; Rodrik, 1998). A possible explanation for the relative responsiveness is that most African agricultural labour is flexible: workers often work several jobs - possibly to diversify sectoral climatic risk (Davis et al., 2014; Reardon et al., 1992). Agriculture saw outside pressure from large urbanization movements for all decades in my sample, and rural areas likely provided competitive (i.e. non-subsistence) alternative sectors of employment (Lanjouw and Lanjouw, 2001). Price controls were largely ineffective (Collier and Gunning, 1999). Overall, tariffs and other interventions should therefore make comparative advantage patterns less pronounced, stacking against either hypothesis. As a robustness check, Appendix E investigates the effect of price support on the findings.

It also seems plausible that many firms in Eastern Africa between the 1960s and the 1980s experienced contracting difficulties, as the model above assumes. Microevidence from that time is scarce, but surveys dated later suggest that uncertainty about contracts is widespread. Bigsten et al. (2000) show that for the several African countries they study (including Cameroon and Kenya), contracts are renegable; court settlement functions imperfectly, and often, breaches of agreements are solved by negotiations outside court. Dercon (1998) argues that in Tanzania, risk and imperfect access to credit led to sectoral allocation away from profitable sectors.

Furthermore, the identifying assumption in my baseline model requires that producers incur up front costs and that these are not easily financable. This setup is borne out by several empirical results, many in the overview of Collier and Gunning (1999). In Africa, the use of machinery differed from other parts of the world. Yet, where manual labour falls short, animal power is used, if not machines. There are exports from sectors that require planting (trees) on long term horizons, or investments in cattle and livestock; and crops that require fallow land. African markets for capital and machinery are relatively illiquid: few firms use second-hand equipment, and used capital goods sell at large discounts (Collier and Gunning, 1999; Gunning and Pomp, 1995). There is significant uncertainty about land tenure and operating rights, often mixing between formal entitlement and traditional tenure and heritability. The uncertainty of the property status shows in lack of up front investments like tree crops (Besley, 1995). Uncertainty about land tenure often also leads to more labor intensive production strategies (Fenske, 2011). Similarly, African farmers would spend windfalls in livestock investments, suggesting their financing constrains are problematic (Dercon and Krishnan, 1996; Kinsey et al., 1998); and credit constraint are prevalent across the whole economy (Bigsten et al., 2003). Together, these suggest that some sectors are held back by the quality of contracting institutions.[10]

[10]Slavery might go against the assumption that labor is hired at "piece rate". While slavery may play a prominent role in the (lack of) organization of inclusive institutions (e.g. the Sokoloff and Engerman (2000) argument), it is not obvious how it affects this analysis of contract enforcement. In any case, slavery is not prevalent in the sample. Italy's invasion of Ethiopia effectively ended most slavery in 1935. The British and the Sultan of Zanzibar banned maritime slave trade in 1876, and the British banned slavery inland after WW I. In Mozambique, one of the last colonies to become independent, forced labour was abolished in 1961.

3.2 Empirical strategy

There are no direct measures for institutional quality in Africa in the 1960s. Instead, as suggested by Nunn and Trefler (2013), I use the variation across different industries in the dependence on institutions. To study the heterogeneous effects of transport costs, I use the variation in different agricultural products.

The theoretical motivation suggests that sectoral exports are sensitive to changes in institutions: the fixed costs involved in production make exports harder, if institutions deteriorate. The following standard gravity equation allows for trade cost shocks specific to the cost structure of each sector:

$$\begin{aligned}\log \text{exports}_{ict} &= \beta_0 + \beta_1 \log \text{distance}_c + \beta_2 \text{fixed cost}_i + \beta_3 \left(\log\left(\text{distance}_{ct}^{shock}\right) - \log\left(\text{distance}_c\right)\right) \\ &+ \beta_4 \text{fixed cost}_i \times \left(\log\left(\text{distance}_{ct}^{shock}\right) - \log\left(\text{distance}_c\right)\right) + \alpha_{it} + \mu_{ct} + \varepsilon_{ict}. \qquad (14)\end{aligned}$$

The variable "$\text{distance}_c^{shock}$ " reflects the shipping distance in the time 1967-1975, which is higher than the pre-1967 shipping distance ("distance_c") for affected countries. The term $\log\left(\text{distance}_{ct}^{shock}\right) - \log\left(\text{distance}_c\right)$ is zero for years in which the Suez canal was open.

The fixed effects α_{ic} and μ_{ct} control for crop-country and country-time specific explanations of trade. Following theory, countries may have different initial conditions and comparative advantages. The patterns of comparative advantage may correlate with overall developments that could bias the estimate of the canal closure effect, so they are absorbed in α_{ic}. Similarly, country-specific shocks that may or may not be caused by institutional change, like a failed coup attempt (Kenya in 1978), the instatement of a one-party system (Tanzania in 1977) or independence (Djibouti in 1977) could affect exports by bringing about different economic policies or exchange rate management. Any correlation between the trade shock and such national events is controlled for by the country-year fixed effects, as long as such events do not systematically affect sectors differently.[11] As the interaction arguments "logdistance_c" and "fixed cost_i" are collinear with the fixed effects μ_{ct} and α_{it}, their parameters β_1 and β_2 are not identified. Effectively, this equation is a "dif-in-dif-in-dif" specification, because it compares the exports of different products over transport costs differences over industries over time. However, the specification where the shock is formulated in differences saves room in the specification.[12]

The regression is consistent with the export flow from the theoretical motivation (eq. 12). The coefficient of interest in the regression is β_4. Coefficient β_4 shows how the exports of a specific commodity respond to the shock in transport costs, depending on whether that commodity relies heavily on fixed costs of production. The comparison of different sectors in the same country allows ruling out confounding explanations for the association between trade and institutions, like the fact that trade is easier in institutionally advanced countries; that trade shocks cause political change; or that conflicts

[11] Many of the major political events do not coincide with the Suez closure: for most countries, independence occurs between 1940 and the early 1960s. In Mozambique, war starts in 1964 resulting in independence in 1975. Dropping Mozambique from the sample does not change the results. Sub-Saharan African countries also saw waves of trade liberalizations, but they predominantly took place in the 1980s.

[12] The alternative "diff-in-diff-in-diff" formulation would be:
$\text{logexports}_{ict} = \beta_0 + \beta_1 \text{logdistance}_c + \beta_2 \text{fixed cost}_i + \beta_3 \left(\log\left(\text{distance}_c^{shock}\right) - \log\left(\text{distance}_c\right)\right) + \beta_4 \text{D(1967-1975)} + \beta_5 \text{variable cost}_i \times \left(\log\left(\text{distance}_{ct}^{shock}\right) - \log\left(\text{distance}_c\right)\right) + \beta_6 \text{D(1967-1975)} \times \left(\log\left(\text{distance}_{ct}^{shock}\right) - \log\left(\text{distance}_c\right)\right) + \beta_7 \text{D(1967-1975)} \times \text{fixed cost}_i \times \left(\log\left(\text{distance}_{ct}^{shock}\right) - \log\left(\text{distance}_c\right)\right) + \alpha_{ic} + \mu_{ct} + \varepsilon_{ict}$

where D(1967-1975) is a dummy indicating the years 1967 to 1975. The coefficient of interest is then β_7, equal to β_5 discussed in the text.

affect both trade and institutions. The approach is intuitively related to Rajan and Zingales (1998): if trade improves institutions, then sectors that require good institutions decline when trade exogenously stops. An important identifying assumption is that higher fixed or up front costs correspond to higher institutional sensitivity. I explain this assumption in section 2 and motivate it empirically in Appendix F. To check the robustness, I check that i) sectors with higher fixed costs indeed thrive in environments with high-quality institutions and ii) that alternative definitions of institutional sensitivity show similar results.

The sensitivity of different products to institutions is quantified using data on expenses from the US Department of Agriculture in 1975 (or for some industries, the earliest possible date). The theoretical motivation suggests that exposed factors of production, like upfront investments and non-variable stages, will be used less when contract enforcement is poor. The factors that can be hired "at the spot" (e.g. day labour) face less of that exposure. To proxy the less institutionally sensitive factor employment, I take the share of total costs that is classified as fixed costs of production from the USDA statistics for individual crops and animals, assuming that products that rely heavily on variable stages of production are institutionally less sensitive. Because the model also suggests comparative advantage arguments, I also proxy capital employment by calculating the share of total costs due to non-land capital. The assumption here is that characteristics of crops retain some similarity across locations. What offsets cow farming from sugar production in American countries, also holds in African countries: the labor costs in sugar production are higher than that in cow farming, while the capital and early-stage investment required for holding cows is far higher. Clearly, the relative price of capital or labor is not equal between the economies, but country year (and crop) fixed effects controls for country-specific absolute deviations in the factor prices. An overview of the product groups used from the USDA data, as well as a crosswalk developed to match the export data is available in the Appendix.

The export data are from the FAO; they reflect data from the respective country to the entire world, from 1960 to 1985. The focus on agricultural exports is not very restrictive, as mineral and agricultural exports accounted for most of African exports in the sample years. There are no bilateral trade data for this period. Earlier and later data suggest Europe is the largest destination by far.[13]

The estimation of this equation needs two modifications from regular OLS. Firstly, around 60% of the export flows are zero. This is not surprising, given that the data are effectively sectoral. Given the zero trade flows, taking the log of exports would lead to a substantial, non-random loss of data. Instead, I estimate the equation using the Poisson quasi-maximum likelihood estimator, which is consistent and can deal with zero-valued flows in the logarithmic form (Silva and Tenreyro, 2006). The standard errors are robust. Secondly, the distance shock conditional on crop characteristics is not independent across observations: countries are affected several years in a row, and several products have the same characteristics (e.g., veal and beef are attributed the same capital intensity). Therefore I cluster the standard errors for different product groups by country and spell (pre-treatment, during treatment, post treatment).

3.3 Evidence from agricultural data

Table 1 presents the results of the main regressions. Most importantly, the coefficient on the interaction between fixed cost shares and the trade cost shock is negative. The negative coefficient suggests that sectors that require larger up-front investments were hurt significantly worse by the increased transport costs than sectors in which costs are more associated to the variable stage of production. The estimate implies that the average transport distance shock leads to around 40% lower export if a crop requires

[13] Estimates from Fouquin and Hugot (2016) suggest that in the 1960s, exports to Europe accounted for around 70% of African exports, while exports to Asia at 7% and exports to other African countries 8% were much smaller. For Eastern African countries (UN definition) Europe accounted for around 65% of the exports, Asia for around 12%.

Table 1: Agricultural products: Effects on log exports

	(1)	(2)	(3)	(4) Pre 1971	(5) Post 1971	(6) Placebo
Fixed cost share x shock log km	-8.38**	-8.45**	-12.25***	-5.94***	-7.84**	
	(3.53)	(3.69)	(3.59)	(2.30)	(3.18)	
Capital cost share x shock log km		17.19	154.17***	5.11	24.59**	
		(11.26)	(11.90)	(16.38)	(10.77)	
Fixed cost share x placebo shock						7.96
						(12.14)
Observations	9,714	9,714	9,714	3,553	6,484	9,204
Country-Year FE	yes	yes	yes	yes	yes	yes
Country-Crop FE	yes	yes		yes	yes	yes
Crop-Year FE			yes			

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

one standard deviation (about 10% of total costs) more fixed costs. The results thus imply that institutionally intense sectors suffered from the rise in transport costs; consistent with the idea that isolation from international trade deteriorates institutions.

Capital intensity may also determine the sectoral reallocation when trade costs change. Indeed, from Heckscher-Ohlin theory, one would expect capital-intensive industries in this sample to flourish with trade isolation: capital-abundant countries become more remote. The regression in column 2 controls for the capital cost share. Its coefficient is positive but insignificant. The coefficient of the fixed cost interaction hardly changes. That is not surprising, given that capital cost shares and fixed cost shares have limited correlation in the agricultural sector (see Figure 1 in the Appendix). When clustering by years instead of treatment spell, the standard error for the capital cost interaction is around 3 (significant at the 1% level). In sum, the fixed cost interaction coefficient is unaffected by the capital cost interaction, and that, if anything, capital-intensive sectors saw relatively higher exports in trade isolation.

The fixed effects structure controls for initial crop conditions and country-specific developments, but not for the swings of agricultural prices on the world market. Column 3 reports a regression where the country-crop conditions are substituted for crop-year specific fixed effects. That fixed effects structure accounts for any global effects on the crop-level caused by the Suez canal closure. In this case, the result on fixed cost shares are similar, if somewhat larger, and the effects on capital intensity larger and significant. The regression with all potential fixed effects (country-year; country-crop; crop-year) gives similar results: the coefficient of interest is -7.60 (with a p-value of 0.12 spell-clustered standard errors; and a p-value of 0.01 under year-clustered standard errors). However, the large amount of fixed effects renders convergence of the maximum likelihood more difficult.

Arguably, the transport cost shock occured twice: first when the Suez canal closed, and then when it opened. To exploit the difference, columns 2 and 3 present the results of running the same regression in a split sample, before 1971 and after 1971 (the middle of the treatment spell). The results remain similar: the blocking of the canal and subsequent opening had effects of similar magnitude (less than a standard error apart), the closing leading to shrinking of institutionally intensive industries, the opening leading to an expansion of institutionally intensive industries. The capital intensity seems to play no role in sectoral decline when the Suez canal closed; but there are discernible effects when the canal re-opened (i.e., a relative decline of capital-intensive sectors). Another concern could be that before the Suez canal re-opened in 1975, mines needed to be cleared from the canal before it became navigable. One might

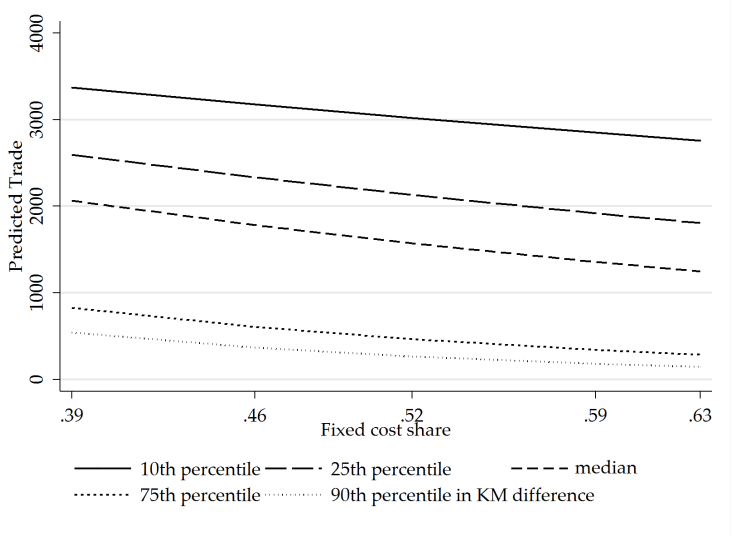


Figure 3: Predicted exports for different magnitudes of the cost shock, according to fixed cost share (conditional on covariates)

argue that the opening of the Suez canal could be anticipated by one year (mine clearing started in 1974). In order to investigate this, I have rerun the specification allowing the spell to end in 1974 and 1973. The (unreported) regressions show no change in the results.

The interaction coefficient between transport costs and fixed cost shares could mask a positive interaction effect on subsegments, because the model relies on the Poisson distribution. To check for such non-linearities, I plot the predicted marginal means of exports by levels of the distance shock over different fixed cost shares (at average of the estimation sample). Figure 3 shows that larger increases in the trade distance are associated with lower export flows. This effect is stronger conditional on higher fixed cost share (the scale runs from the 10th percentile to the 90th percentile). Together, there is no evidence to suggest that the negative interaction coefficient covers any positive interaction effects.

3.4 Sensitivity

To rule out spurious explanations, I run a placebo regression, reported in column 6. It uses the same sample and the same transport costs shock. However, the regression is run as if the shock hit between 1960 and 1963; relatively peaceful years for the Suez canal. As can be seen from column 3, artificially dating the shock earlier in time leads to insignificant results, as expected. The coefficient is closer to zero when running a placebo regression by assigning the shock to random years; and randomly assigning the observed transport shocks across countries also leads to insignificant results.

Ideally, the trends of affected and unaffected countries should be similar before the shock to lend credibility to the results. The placebo regression in Table 1 shows no divergent trends between crop sensitivity between countries that would later be affected and those that would remain unaffected. To check for trends in exports related to fixed cost intensity that differ before 1967 between affected and unaffected countries, I run the exports regression containing the interaction between fixed costs shares and eventual treatment. The results are reported in Appendix G; they show no diverging trends in the difference between low and high fixed costs sectors across affected and unaffected countries.

Exports of goods that require large fixed costs could also drop more during the canal lockdown, if such goods have a larger sensitivity to distance, or if they are exported disproportionately to Europe. To check this, Appendix D considers bilateral export data of the same agricultural crops. Bilateral export

data from the FAO date back to 1986 (the end of the baseline sample). I find no structural association between the fixed cost share of a product and its distance sensitivity, nor that Europe imports such goods disproportionately in general or from African countries. Finally, I check whether differences in distance decay between products can explain the response to the Canal closure. I estimate the product-specific distance decay parameters from the bilateral exports. Then I impute the percentage decrease in export flows for each product following the Suez canal closure. Because the data before 1986 are not bilateral, I impose that the decrease on all exports, to be conservative. Taking out the predicted export reductions before running the above dif-in-dif regression yields similar results.

Governments' responses to the freight cost shock might affect the estimated shock magnitude. If governments selectively support sectors after a trade cost shock, sectoral exports patterns could be mistakenly attributed to trade cost shock. If a government provides little support to sectors that are hit worst by the transport shock, the above estimates could be exaggerated. In a subset of the sample, price assistance data are available (see Appendix E for a further analysis). The change in assistance measures shows no jump in 1967, but develops strongly in 1975 when the canal was reopened. I find that governments support the sectors that are hit most severely, if there is a relation at all. The above estimates therefore seem biased towards zero, if anything. Directly controlling for observed assistance shows no change in results.

The identification in the above regression requires that up-front investment are sensitive to expropriation. In Appendix F, I consider this assumption in trade data from the same FAO source. However, I look at later years, so the data can be joined with institutional indexes from the World Governance Indicators. There is a positive correlation between the quality of "rule of law", and the average fixed costs in exports for a country. I also report a gravity equation with fixed effects for the origin-year and destination year; and fixed effects for the product-year. This rules out country-level explanations of institutional quality that can correlate with the country's economic openness; and world market demand shocks. The gravity equation shows that countries with higher institutional scores tend to export more goods that require up-front investments.

Finally, the trade cost shock is not unique to Africa. In the Middle East and Central Asia, there is another set of countries that has more than average exposure to the trade cost shock. Moving east from the Suez canal along the coast, the group of countries with harbors on the Indian ocean and no obvious land routes to Europe include: Yemen (main port Aden); Oman (Sultan Qaboos); Pakistan (Karachi); India (Mumbai); Bangladesh (Chittagong); Myanmar (Thilawa) and Malaysia (Port Kelang). For these countries, the average increase in shipping distance to Europe is 53%. However, unlike the African sample, in the Asian geography, the ordering of countries in absolute change in seamiles and in relative change in seamiles may not be the same: the extra seamiles in absolute terms is roughly equal between India and Malaysia, but the relative impact is lower in Malaysia because its trade route to Europe is longer. To avoid defining assumption on trade costs, I simply run the sectoral export regression with a treatment dummy (equal to 1 between 1967 and 1975) interacted with sectoral fixed costs, and the fixed effects structure as before. The interaction coefficient is -1.82***, implying that during the closure of the Suez canal, if a sector has 10% higher fixed cost share, its exports declined 8% faster. This is consistent with the earlier results. However, more caveats apply to this sample. There is no control group of countries with unaffected sea routes so the coefficient is identified solely from variation over time. Moreover, the alternative export destinations are less clear: Malaysia, for instance, may have easier access to other markets like Japan or the U.S.

3.5 Crop appropriability

Most theory of institutional change points to factor markets as the channel through which international causes institutional change. However, another literature points to crop characteristics that determine whether the crop is sensitive to institutional quality. The results above are intimately related to factor market processes. However, if institutions change, production may change because the output is sensitive to institutions, too.

I follow the theory of Mayshar et al. (2015) in distinguishing between cereals and roots and tubers. Roots and tubers like potato and cassave are high-calory substitutes for cereals in many parts of Africa. However, tubers and roots cannot be stored - unlike cereals, they rot shortly after harvesting. As a result, cereal crops are much easier to confiscate than tubers. Mayshar et al. go on to show that the local relative productivity of cereals sparks a demand for social protection and generates hierarchy. For the purpose of the current analysis, however, I only rely on the argument that cereals are more sensitive to appropriability. Indeed, storage time explains large shares of the risk of theft (Fafchamps and Minten, 2001). The distinction of crops according to their sensitivity of theft, confiscation or other appropriation is founded in anthropological literature too. That literature describes the social effects of crops and food sources that provide immediate consumption versus those that come with delay between effort and consumption (e.g. the front-back loaded model, Tushingham and Bettinger, 2013).

As an alternative check on the results, I examine the differential effects between cereal crops and tubers. I use the same difference-in-difference approach, which examines whether cereal exports increased relative to tubers for countries that saw isolation in international trade. Cereals in my sample constitute rice, maize, wheat, barley, oats, rye, sorghum and millet. Tubers and roots are potatoes, sweet potatoes and cassave. I include the directly derived products (cake and bran) in these groups.

Table 2: Institutional sensitivity: Effects on log exports

PPML	(1) PPML	(2) PPML | later sample
Cereal x Shock log KM	-6.71***	
	(1.47)	
log Distance		-0.84***
		(0.16)
Border		0.58***
		(0.12)
Cereal x Rule of Law		0.52**
		(0.24)
Observations	1,500	4,884
country-year FE	yes	yes
country-product FE	yes	
destination-year FE	NA	yes

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1.

Table 2 shows the results of the regressions explaining crop exports for cereals versus tubers. The dummy *cereal* is one for cereal crops and zero for roots and tubers (other crops are not in the sample). The first column shows a negative coefficient for the interaction between the trade costs shock and cereals, using the pseudo Poisson estimator. Consistent with earlier results, the more institutionally intensive cereals see a drop in exports compared to tubers when trade costs increase. The coefficient implies that during the shock, the average decline in cereal relative to tubers was around 19 percentage points.

The second column of Table 2 is a check on the institutional sensitivity of cereals relative to tubers in international trade flows, like the regressions reported in Appendix F. It is a gravity model for agricultural exports run on a sample of countries over the years 1995-2001, controlling for origin-year and destination-year specific fixed effects. It shows that given the country-year effects, the exports of cereals are high relative to tubers when the country has high levels of the indicator for rule of law. This lends support to the argument that cereals are more institutionally intensive. In unreported regressions, this result is confirmed for other institutional indicators. A positive correlation between distance of trade and the cereal status could alternatively explain the result. However, running the same bilateral gravity equation for 1986 data, like in the above sensitivity check (also detailed in Appendix D) shows no evidence for that possibility.[14]

3.6 Evidence from manufacturing goods

The identifying assumption in the above regressions is that different agricultural products respond differently to institutional changes due to differences in their production technology. However, a good's institutional sensitivity may surface in other characteristics. As Berkowitz et al. (2006) argues, institutionally poor environments might make it costlier to produce institution-intensive goods; but the intensity may also be the result of product complexity.

To corroborate the evidence from agricultural exports, I present similar regressions based on different definitions of institutional dependence. Instead of using up-front investments as variation in institutional sensitivity, I rely on the good's type as classified by Rauch (1999) into differentiated and homogenous (reference-priced or organized exchange). This primarily follows Ranjan and Lee (2007) and Berkowitz et al. (2006), who both argue that a good's degree of differentiation determines how intensively it's production relies on institutions. The idea is that homogenous goods are easily sold if a trade partner cannot be held to his contractual obligations, and therefore run less risk when contract enforcement is poor. Differentiated goods, which cannot easily be substituted and are often tailored to the buyer, require larger relationship-specific investments, which have high exposure if contracts fail. Both Ranjan and Lee and Berkowitz et al. show that good institutions are conducive to trade in differentiated goods especially. I also follow Nunn (2007), who argues that the contractual intensity of a good depends on the type of goods used as inputs: firms that need differentiated products from upstream supplier rely more heavily on easy contract enforcement. Nunn similarly shows that institutional quality works as a comparative advantage, as high indexes of institutional quality in a country lead to relative specialization into firms that use differentiated inputs.

The export-to-world data for these regressions are from the COMTRADE database, based on an SITC4 classification. These are matched with the Rauch classification, and the upstream product characteristics from Nunn.[15] The empirical strategy is the same as described in the previous subsection.

Table 3 present the results using product differentiation as a measure of the dependence on contract enforcement. The negative coefficient of the interaction shows that when the distance shock took place, firms that produced differentiated goods were particularly hit. The coefficient suggests that in affected countries, the trade costs shock reduced exports in differentiated sectors around 23% more than in non-differentiated sectors. The second column of Table 2 shows a regression for reference-priced goods, that are least sensitive to institutional quality. It shows that these goods saw a relative upswing when trade

[14] A gravity equation with origin and destination fixed effects and an interaction for the dummy cereal and distance suggests that cereals have no significantly different distance sensitivity, although the coefficient of the interaction (cereal X log distance) is positive (0.42, p-value 0.29). Calculating the predicted differential export effect from the distance decay difference in the gravity equation; and taking it out of the export flows in the original sample yields a slight attenuation of the coefficient of interest. The coefficient reported in column 1 changes to -6.65*** when taking out distance-decay predicted effects of the canal closure; not leading to qualitative changes in the conclusions.

[15] I use the crosswalk from James Markusen.

Table 3: Differentiated products: effects on log exports

	(1) PPML	(2) PPML	(3) PPML
Shock log km x Differentiated	-8.00*		
	(3.75)		
Shock log km x Reference		5.17***	
		(1.92)	
Shock log km x Inputs diff.			-19.51***
			(6.38)
Observations	4,765	4,765	3,899
country-year FE	yes	yes	yes
crop-country FE	yes	yes	yes

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

costs increased (the complementary group, goods sold on organized exchange, is argued to be between the other two in terms of dependence on institutional context). Following the argumentation of Nunn (2007), the third column considered an industry's dependence on differentiated inputs, rather than its final product. Whether the firm produces differentiated goods or uses differentiated goods as inputs does not seem to matter much: either way, dealing with differentiated goods led to stronger contractions when the Suez canal closed. The coefficient implies that a sector's trade decline was on average 10% stronger relative to its unaffected counterpart, if those sectors have 17% (one sample standard deviation) more differentiated inputs.

4 Conclusions

This paper exploits the closing of the Suez canal (Feyrer, 2009) to assess how international trade affects institutions. Theory suggests that there may be opposing effects on institutions when countries liberalize international trade. On the one hand, trade may lead to specialization in comparative advantage industries. In developing countries, such specialization can expand industries that demand poor property rights and contract enforcement. On the other hand, increased access to the world market pushes all firms to demand productivity-conducive institutions: easier participation in the world economy implies that the high factor prices associated with expropriation cause large losses of sales.

The empirical results show that when the Suez canal closed, African countries behind the Suez canal saw a fall in institutionally intensive production. This sectoral pattern suggests that international trade contributed to local institutions, rather than eroded them. The result controls for confounding country-specific developments and holds across different definitions of institutional sensitivity.

The evidence in this paper complements earlier methodologies to identify a causal relation of trade. The closing of the Suez canal was not influenced nor anticipated by the countries in the sample, making it a "quasi-experiment" for a substantial shock to trade costs. The quasi-experiment helps to interpret causal effect of trade on institutions, adding to earlier results using instrumental variable approaches and dif-in-dif approaches.

The sectoral focus of the paper joint with the African setting allows an accurate evaluation of the "institutional comparative advantage" argument against international trade. According to that argument, institutionally poorly developed countries specialize further into institutionally malevolent industries

when opening up to trade (formulated in Levchenko, 2007, and ensuing literature). Eastern African countries in the 1960s and 1970s were institutionally disadvantaged compared to the European countries from which they were cut off. While the context of the sample obviously confines the generalizability of the results, the sample seems one of the more plausible candidates for "adverse institutional specialization" to occur.

It is not obvious whether poor institutions affect goods markets or factor markets. Empirically, this paper takes no stance - institutional measures based on production factors, on products or on inputs yield qualitatively similar results. That is not surprising, as a country's different measures of institutional quality are often correlated. Theoretically, this paper offers one theoretical argument for institutional change through factor transactions. Related literature also points to land tenure institutions (Field et al., 2006), particularly in crop selection (e.g. Deininger and Jin, 2006; Smith, 2004; Markus Goldstein, 2008).

In the debate on "aid for trade", my results support the idea that trade can improve institutions. Yet, they are not evidence of overall effectiveness of those policies. Nor is this paper evidence for economic growth effects, suggested by a literature on crop and nutrition choices and their effects on social interaction and development (Demsetz, 1967; Sokoloff and Engerman, 2000; Tushingham and Bettinger, 2013; Mayshar et al., 2015). That conclusion takes more steps - that aid increases trade; and that trade activates the specific institutions that foster economic growth (see, e.g. Cadot et al., 2014; Hühne et al., 2014).

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A Analytical Appendix

A.1 Trade liberalization, sectoral expansion and factor prices

First, I define the comparative advantange sector of a country to be the sector that intensively uses the factor with a low relative price in the country. I assume technology to be the same in the home country and the rest of the world. From the definition of the sector-specific inputs and its production technology, $\pi_z \rightarrow \infty$ as $n_z \rightarrow 0$, so production occurs in all sectors. The sectoral revenue in z is $\tau^{1-\sigma}\left(\frac{mc_z(1,\rho_z,r)}{mc_z(w^w,\rho_z^w,r^w)}\right)^{1-\sigma}\frac{b_z n_z}{n_z^w}Y$. The price (marginal costs) relative to the world price of z determines how trade costs reductions affect output. The increase in $R_{z'}$ is larger than R_z if $mc_z/mc_z^w b_z^{\sigma-1} < mc_{z'}/mc_{z'}^w b_{z'}^{\sigma-1}$.

The number of firms increases in the sectoral revenue. Under an isoelastic demand function, firms charge a constant markup. The markup implies that a share $1/\sigma$ of revenue is operating profit. Under the zero-profit condition (ZPC), operating profits need to cover the fixed costs. Firm-level revenue (and thus operating profits) fall in the number of firms that employ the sector-specific input, because fiercer competition on inputs implies a higher factor price. From the ZPC:

$$R_i\left(\bar{n_z}\right)/\sigma = \phi r k_f + \omega. \tag{15}$$

As the right-hand side of this equation is unaffected by the number of firms, the left-hand side implies that when sectoral revenue increases, the number of firms in the sector rises. The model thus exhibits an Heckscher-Ohlin result: trade liberalization causes sectors that uses the relatively cheap sector intensively to expand.

Wages and rents also change with trade liberalization. By Shepard's lemma, the change in capital demand at the sector level is:

$$\frac{dk_z}{d\tau} = d\frac{\partial TC_z/\partial r}{d\tau}. \tag{16}$$

In a zero-profit equilibrium, total costs equal total revenue (less contributions) and I assume that the cost function is twice differentiable. Given the sectoral revenue responses to trade liberalization, the lemma suggests that factor demand expands for intensive factor of comparative industries. With fixed factor supply, the prices of the factor intensively used in comparative industries thus rise. Note that it is not necessarily appropriate to talk of relative scarcity: theoretically, countries may have a relative abundance of capital, but a comparative disadvantage in capital-intensive industries because of poor institutions.

Trade liberalization this follows both Ricardian and Heckscher-Ohlin type forces. It is not possible to say ex ante what the net effect on factor prices and sectoral expansion is. A labor abundant country may have Ricardian advantages (i.e. high E_z) in industries that are capital intensive; potentially offsetting Hecksher-Ohlin motives.

A.2 The effect of trade liberalization on political contributions.

The total contributions are given by $\Omega = \sum_z n_z \omega_z$; the equilibrium violation of social welfare due to poor insitutions is determined by $d\Omega/d\phi$. My interest is in how trade costs change the marginal contributions for poor institutions, i.e.: $\frac{d^2\Omega}{d\phi d\tau}$.

The marginal effect fo deteriorating institutions on contributions is:

$$\frac{d\Omega}{d\phi} = \sum_z \left[n_z \frac{d\omega_z}{d\phi} + \frac{dn_z}{d\phi}\omega_z \right]. \tag{17}$$

First, it is possible to eliminate the second term, $dn_z/d\phi$. Firms enter until profits are driven to zero. I use implicit differentiation of the profit function to identify $dn_z/d\phi$:

$$\frac{dn_z}{d\phi} = -\frac{\partial \pi_i/\partial \phi}{\partial \pi_i/\partial n_z}. \tag{18}$$

Using the envelope condition, the term $\partial \pi_i/\partial \phi$ (ignoring effects on factor inputs) is the first-order condition on optimality of the bribe, and so must be zero. In equilibrium, a deterioration of property rights has marginally no effect on firm entry, because it does not affect firm profitability.

The net effect of trade costs on expropriation is then:

$$\frac{d^2\Omega}{d\phi d\tau} = \sum_z \left(\frac{dn_z}{d\tau}\frac{d\omega_z}{d\phi} + n_z \frac{d^2\omega_z}{d\phi d\tau} \right). \tag{19}$$

The effect of trade cost changes requires understanding the sectoral changes ($dn_z/d\tau$); the equilibrium level of sectoral contributions ($d\omega_z/d\phi$); and firms' change in willingness to bribe $d^2\omega_z/d\phi/d\tau$. I will discuss the terms in turn.

Changes in the number of firms are determined by how profits are affected. To determine $dn_z/d\tau$, I differentiate the profit function using the envelope condition:

$$\begin{aligned} \frac{dn_z}{d\tau} &= -\frac{\partial \pi_i/\partial \tau}{\partial \pi_i/\partial n_z} \\ &= -\frac{(1-\sigma) R \left(\frac{1}{\tau} + \frac{dmc/d\tau}{mc} \right) - e_z \frac{d\rho}{d\tau} - k\frac{dr^*}{d\tau}}{(1-\sigma) R_i \frac{dmc_z/d\rho_z}{mc_z}\frac{d\rho_z}{dn_z} - e_z \frac{d\rho}{dn_z}}. \end{aligned} \tag{20}$$

The sectoral expansion after trade liberalization closely follows the sectoral profit changes of trade liberalization. Since $\partial \pi_i/\partial n_z < 0$ by the free entry condition, the sectoral expansion takes the sign of the numerator. The numerator suggests that industries expand if their firms have i) large revenues ex ante and ii) intensively use factors that see lower factor price rises (i.e. if the marginal costs fall).

If the policymaker change the quality of institutions, the change in expected contribution from each firm is given by how the profits of each firm change:

$$\frac{d\omega}{d\phi} = (1-\sigma) R_i \frac{dmc_z/dr_z}{mc_z}\frac{dr_z}{d\phi} - \frac{dTKC_i}{d\phi}. \tag{21}$$

This term collects the two opposing direct effects of poorer contract enforcement on the profit function: they increase marginal costs and reduce sales (first term), but also decrease the total costs because larger shares of capital are retained (second term). There are no effects on the sectoral input prices (ρ) because entry does not change following (18).

Finally, the last term in (19) requires understanding how the above $d\omega/d\phi$ changes in trade costs. Pre-multiplying with n_z as a constant, trade costs changes the sensitivity of contributions to poor contract enforcement as:

$$\begin{aligned} n_z \frac{d^2\omega_z}{d\phi d\tau} &= (1-\sigma)\frac{dmc_z/d\phi}{mc_z}\frac{n_z dR_z}{d\tau} + (1-\sigma) n_z R_i \frac{d}{d\tau}\frac{dmc_z/d\phi}{mc} && (22) \\ &\quad -n_z \frac{d^2 TKC_i}{d\phi d\tau} && (23) \end{aligned}$$

The second step assumes that changes in the equilibrium return on capital due to institutional changes and due to trade costs changes are log-separable. The model has no discussion of how the outside

option for the capital supplier is decided - it is not clear how trade costs change the trade-off between the contract with the firm and the outside option. Taking the fixed capital share and ratio between equilibrium and outside options returns as constants with respect to trade costs, the total capital costs sensitivity to institutional changes is:

$$\frac{dTKC}{d\phi} = k\frac{dr^*(\phi)/d\phi}{r^*(\phi)}\frac{\left(1-\phi k_f/k\right)}{1+\bar{r}/r^*(\phi)} \tag{24}$$

If the effects of trade costs and institutions on equilibrium capital returns are log separable, then $d\frac{dr^*(\phi)/d\phi}{r^*(\phi)}/d\tau = 0$. In that case, the total capital costs changes in trade costs are capital by $\frac{dTKC_i}{d\phi}n_z\frac{dk/d\tau}{k}$. Equation (22) then becomes:

$$n_z\frac{d^2\omega_z}{d\phi d\tau} = (1-\sigma)\frac{dmc_z/d\phi}{mc_z}\frac{n_z dR_z}{d\tau} - \frac{dTKC_i}{d\phi}n_z\frac{dk/d\tau}{k} \tag{25}$$

This step, along with equations (19), (20) and (21) gives the policy-maker's first-order condition (11) discussed in the text.

B Figures

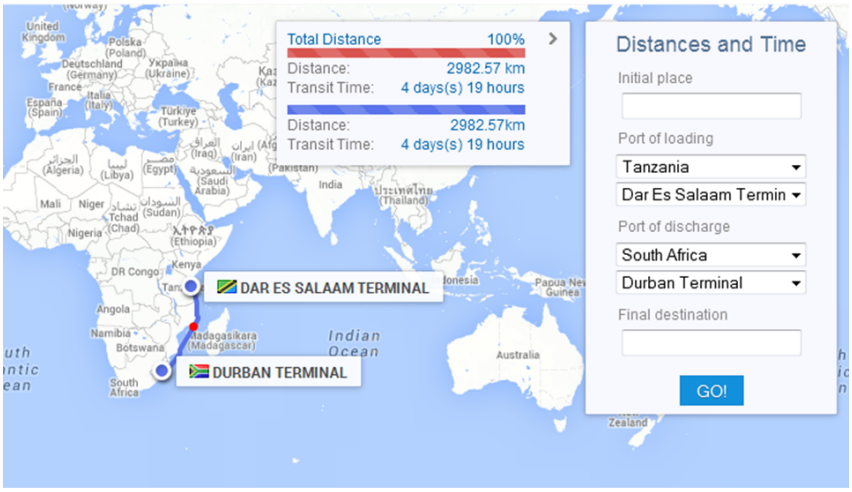


Figure 4: Shipping distance calculator from searates.com

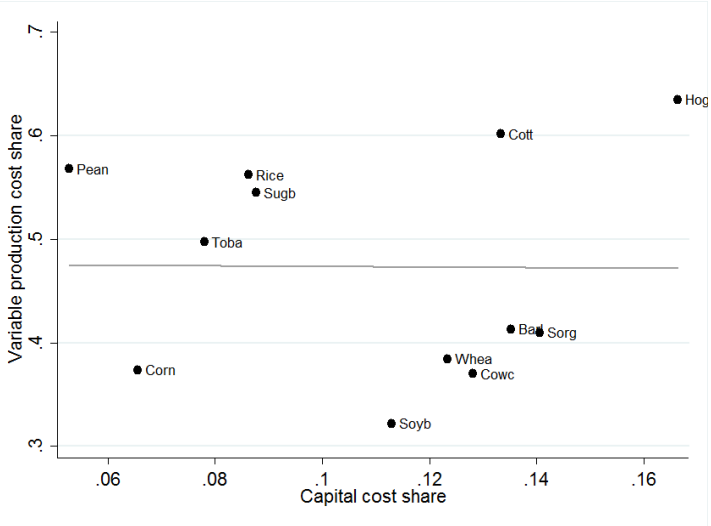


Figure 5: Capital cost share and variable input cost share for different industries

C Countries in the sample and their main ports

Angola (Luanda); Cameroon (Douala); Congo (Pointe Noire); Democratic Republic of the Congo (Matadi); Djibouti (Djibouti); Equatorial Guinea (Bata); Eritrea (Assab); Ethiopia PDR (Djibouti); Gabon (Libreville); Kenya (Mombasa); Madagascar (Toamasina); Mozambique (Beira); Namibia (Walvis Bay); Nigeria; Somalia (Mogadishu); South Africa (Durban); Sudan (former) (Port Sudan); United Republic of Tanzania (Dar Es Salaam).

D Distance decay and fixed costs

In the above results, the higher sensitivity to trade isolation of sectors with higher fixed costs is interpreted as a symptom of deteriorating institutions. That interpretation would be invalid, if product with higher fixed costs have structurally different trade costs, or if they are exported more to the destinations that experience a shock.

The regressions in Table 4 show no evidence of such distortions. The first column exploit bilateral trade data from 1986 (the first available year). The dependent variable is the mean distance shipped of an export crop from a specific country (the export distance weighted by the size of exports). Conditional on the origin fixed effects, fixed cost shares embodied in the agricultural products do not predict export distance in this sample.

Table 4: Fixed costs, distance and destinations

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Distance	Log Export	Log Export	Log Export	Log Export	Log Export[a]
Sample	World	World	African exporters	World	African exporters	Main sample
Fixed cost share	-894.36					
	(1282.03)					
log Distance		-0.99***	-0.88	-0.46***	0.43	
		(0.35)	(0.99)	(0.06)	(0.46)	
Fixed cost share x log Distance		0.89	2.53			
		(0.72)	(2.57)			
Fixed cost share x shock log km						-6.99*
						(3.62)
Capital cost share x shock log km						17.05
						(11.91)
Fixed cost share x Europe				-0.58	1.44	
				(1.35)	(3.80)	
Observations	578	14,731	372	14,731	372	4,422
Origin FE	yes	yes	yes	yes	yes	
Destination FE		yes	yes	yes	yes	
Crop FE		yes	yes	yes	yes	
Country-year FE						yes
Country-crop FE						yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1. [a]Export cleared from prediction (see text)

The second and third column in Table 4 allow distance decay conditional on fixed cost shares of the exports. The interaction of fixed costs shares is insignificant, suggesting that the distance decay in the 1986 agricultural exports is not systematically associated with the fixed costs embodied in the products. This holds for the global sample (column 2), as well as for the subsample of African exports (column 3).

The second and third column in Table 4 test whether exports to Europe represent significantly higher fixed costs, by interacting fixed cost shares with a dummy for export flow destined to Europe. Europe does not import agricultural goods that rely more on fixed costs, both from the world, and from African countries.

The last column in Table 4 runs the original dif-in-dif regression, with a modification for expected export changes from the distance shock. The modification consists of two steps. First, I estimate the specific distance decay for every product in the bilateral trade dataset. It is a standard gravity equation, explaing log exports from log population-weighted distance and borders using importer and ex-

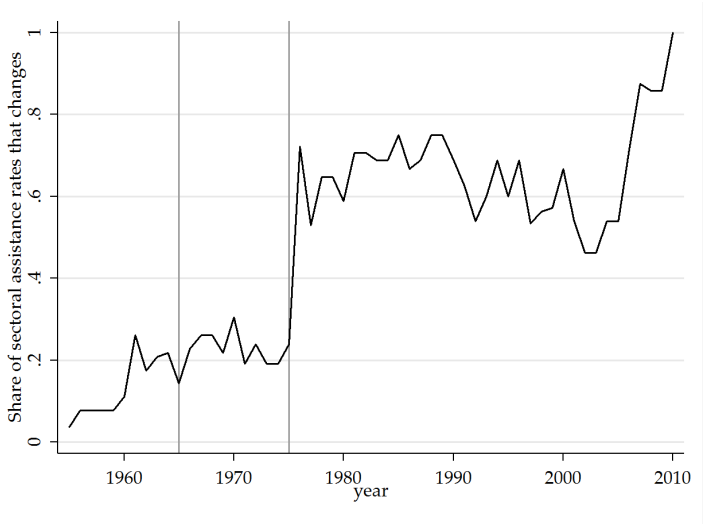


Figure 6: Share of the country-crop pairs that experienced a changing assistance pattern by year

porter fixed effects. Based on the percentage trade distance shock from the Suez canal closure, I predict the change in exports for every product for all affected countries - these are predictions based on the distance-sensitivty of the product. In the second step, I take export changes predicted by the distance decay out of the observed export flows, before running the original dif-in-dif model. The assumption here is that the model now examines export variation after the trade cost shock above and beyond what would be expected based on the sensitivity to distance of each product. The results are reported in column 6. They suggest that the interaction between fixed cost shares and the trade cost shock is slightly less clear (from -8.45*** to -6.99***, around 20% decrease in magnitude) but the qualitative conclusions are similar.

E Price assistance

Many African countries in the 1960s and 1970s supported agricultural production by pricing instruments. The effective support by product is available for a subset of the data in the paper. For the crop classification used in the main results, there are observations on price assistance on the countries Cameroon, Ethiopia, Kenya, Madagascar, Mozambique, and Tanzania (Anderson and Valenzuela, 2013). These allow a comparison of changes in price assistance to changes in export patterns.

To examine overall changes in the assistance patterns, I examine how often they change. Figure 6 tracks the changes in nominal assistance rates. Nominal rates of assistance are the effective estimated price supports in percentage terms. The Figure shows for what share of all crops in all countries in the sample, price assistance rates changed. There is an upward trend: in the 1960s, on average, one in five sectors (in a given country) saw changes in assistance, but that number has risen towards 80 percent in the 1980. There is no clear change in the years around the closure of the Suez canal, but the number of changes triples around the re-opening of the Suez canal.

Table 5 presents further analysis of the nominal assistance rates. The first column considers how the trade cost shock affects assistance rates according to fixed cost shares. It suggests that during the closure of the Suez canal, sectors with higher fixed cost shares received no lower or higher price assistance. Column 2 reports a regression focusing on a time-span two years before and after the closure. It suggests that at the start of the closure, assistance was higher for industries with higher fixed cost shares. This suggests the results from Table 1 may be understated, the sectors in decline received stronger gov-

ernment support. At the re-opening of the Suez canal, Figure 6 shows a marked increase in changes in the assistance rates. Column 3, however, suggests those changes are not correlated to fixed costs shares.

Columns 4 to 6 report the baseline regressions on the sample for which price assistance rates are observed. It is consistent with earlier results, but shows large sample selection. Introducing price assistance as a control confirms earlier results, if significantly larger than in the original sample. This is not due to the introduction of the price assistance control: running the baseline regression on the same sample (column 5) shows that the estimate is almost unaltered. The same holds when introducing capital cost shares.

Table 5: Nominal rates of assistance

	(1) Assistance OLS	(2) Assistance OLS 65 to 69	(3) Assistance OLS 73 to 77	(4) Export PPML	(5) Export PPML	(6) Export PPML
Rate of assistance				-0.46		-0.46
				(0.66)		(0.66)
Fixed cost share x shock log km	0.86	1.56***	0.52	-78.91***	-77.52***	-79.28***
	(0.91)	(0.00)	(0.84)	(24.06)	(23.60)	(24.44)
Capital cost share x shock log km						-1.31
						(46.84)
Observations	1,338	138	223	989	989	989
country-year FE	yes	yes	yes	yes	yes	yes
crop-country FE	yes	yes	yes	yes	yes	yes

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The second column shows that controlling for the observed assistance changes does not affect the main result - the shock has a larger negative impact on sectors that face higher fixed costs. The coefficients are identified from a much smaller sample than the sample in the main text. To benchmark the coefficient, I estimate the baseline regression in the sample for which assistance is observed, in column 3. The results show that the coefficient is negative, and that controlling for assistance attentuates the estimate of the fixed costs effect in the export decline by around 10%. Overall, the coefficients represent much larger effects, however. The sample for which price support is recorded does not seem to be representative for the larger sample.

Columns 4, 5, and 6 show the same regression results, but with the interaction between a sector's capital share and the trade costs shock included. Controlling for the capital cost shares again does not change the results much. When explaining the level of assistance, introducing the trade cost interaction with capital cost share reduces the coefficient of the fixed cost share and trade costs interaction by around 60%, suggesting that capital intensity may pose a stronger motive for price support. In unreported regressions, I used border market price supports instead of general price supports. The correlation between the measures is very high (0.97) and the result show no change.

F Institutional sensitivity by crop

An important identifying assumption drawn from the theory is that fixed costs pose barriers if institutions are poor. Because there is little measurement of institutional quality in African countries in the 1960s, it is hard to confirm the correlation between fixed costs and institutions directly. Yet, it is

desirable to verify whether fixed costs indeed pose institutional barriers.

To check whether fixed costs are indeed more of a barrier in institutionally poor countries, I check the predictions in a sample with more information on institutions. I compare the FAO trade data to the institutional indexes of the the Worldwide Governance Indicators by the World Bank. The "Rule of Law" variable is a widely used measure of institutional quality and seems applicable in the context of my theoy: it comprises the enforcement of contracts and property rights, the quality of police and courts, and the likelihood of crime. I match the indicator with bilateral trade data from the FAO that follows the same product classification as the data used earlier. The overlap produces a dataset of 156 countries over the years 1996-2011.

Figure 7: Rule of Law and the average fixed costs involved in exports

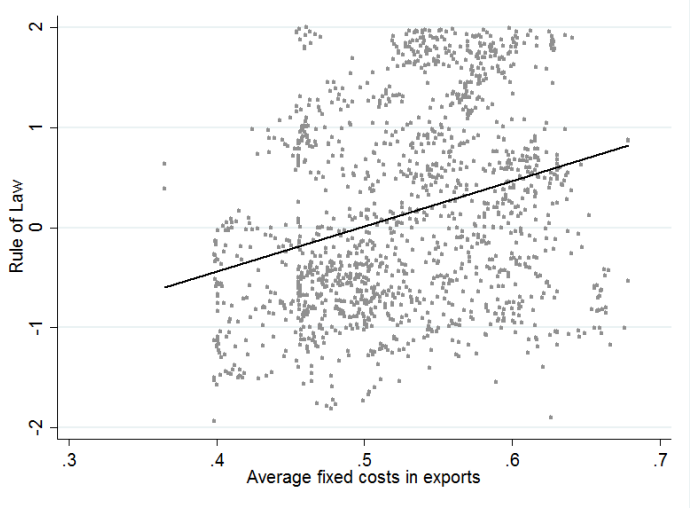


Figure 7 scatters the Rule of Law indicator and the fixed costs involved in exports. The fixed costs are calculated as the export-weighted fixed cost share for each country in each year. The data confirm that countries with higher institutional scores have higher average fixed costs shares in exports. A one standard deviation increase in the Rule of Law score is associated with higher fixed cost shares in exports of around a third of the sample standard deviation (significant beyond the third decimal).

The association between institutional indicators and exports' fixed costs shares may be driven by confounders, however. To exclude that country- and product-level variables explain the association, I also estimate a gravity equation. The gravity equation uses bilateral product-level data from the FAO - the data of the above scatterplot in their bilateral version. To control for any effects at the product-level and the country-level, I introduce product-year and origin and destination country-year fixed effects.[16]

Table 6 present the results from estimating the gravity in the larger sample. The first column shows coefficients consistent with most other estimated gravity equations: an estimated distance elasticity around minus unity and significant border effects. In column 2, there is an interaction between the institutional index (Rule of Law) of the origin country and the fixed costs share involved in the production being exported. The individual arguments of this interaction are absorbed by the fixed effect: the institutional indicator by the origin-year fixed effect and the fixed costs share by the product-year fixed effect. Thus, the interaction suggests that conditional on any country and product level characteristics, fixed costs intensive products are exported more often from institutionally advanced countries.

Further regressions confirm the result that fixed-costs intensive industries rely on institutions. To exclude capital sensitivity as an explanation, column 2 shows the interaction between capital shares

[16]This is the most conservative fixed effects strategy. Restricting to time-invariant fixed effects or dropping product-specific fixed effects gives the same results.

and institutional quality in addition to the fixed costs share interaction. Conforming to intuition, better institutions foster capital intense exports. Importantly, this does not affect the estimated effects of fixed costs qualitatively. That adding capital intensity does not change the results regarding fixed costs is no surprise, as fixed costs share and capital intensity show no strong correlation. The last columns repeat the analysis for the other institutional indexes from the World Governance Indicators, each confirming the earlier result.

Table 6: Institutional sensitivity: Effects on log exports

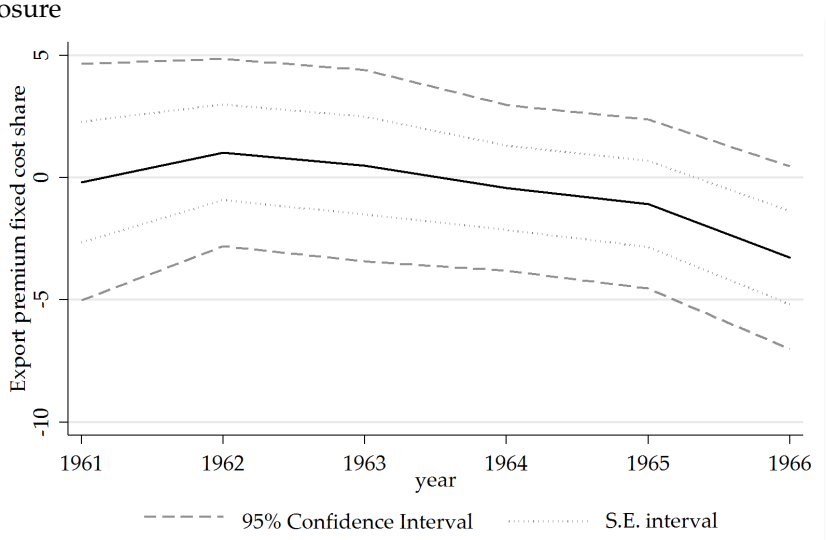
	(1)	(2) RL	(3) RL	(4) CC	(5) GE	(6) PV	(7) RQ	(8) VA
Distance (log)	-0.85***	-0.85***	-0.87***	-0.87***	-0.87***	-0.87***	-0.87***	-0.86***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Border	0.80***	0.81***	0.82***	0.81***	0.82***	0.81***	0.81***	0.81***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Fixed x RoL		1.10***	1.44***	1.37***	1.61***	2.27***	1.53***	1.65***
		(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)
Cap. x RoL			8.79***	8.32***	8.37***	10.44***	8.90***	8.33***
			(0.19)	(0.17)	(0.20)	(0.22)	(0.22)	(0.20)
Observations	243,228	243,228	243,228	243,228	243,228	243,212	243,228	243,228
Origin-year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Destination-year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector-year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Indicator codes: RL: Rule of Law; CC: Control of Corruption; GE: Government Effectiveness
PV: Political Stability and Absence of Violence; RQ: Regulatory Quality; VA: Voice and Accountability

G Pre-shock export differences for high fixed costs share sectors

Estimates of divergence before the trade cost shock are obtained by running the regression: $\text{logexports}_{ict} = \mu_{ct} + \mu_{ic} + \sum_t \beta_t \times D_{treat} D_{year} \times \text{fixed cost share} + u_{ict}$ where μ indicates a multiplicative fixed effects along time (t), country (c) or crop (i) dimensions. D_{treat} denotes a country that is eventually affected by the trade cost shock. The coeffient β_t captures, for year t, the additional sensitivity of exports to a higher sectoral fixed cost share in pre-affected countries. Figure 8 reports the estimates for β_t in different years before the shock.

Figure 8: Effect of having a higher fixed cost share on exports in affected vs unaffected countries before the Suez canal closure



H Products by category

Category (USDA)	Product
Barley	Barley; Barley (pearled)
Corn	Sweet corn (frozen); Sweet corn (preserved); Flour (maize); Maize; Oil, maize; Cake, maize
Cotton	Cotton lint; Cotton waste; Cottonseed; Cotton, carded, combed; Oil, cottonseed; Cake, cottonseed
Cow/Beef	Butter (cow milk); Cheese (whole cow milk); Milk, skimmed cow; Milk, whole fresh cow; Skins, calve; Meat beef preparations; Meat, cattle boneless (beef and veal)
Hogs	Meat, pig; Meat, pig sausages; Meat, pig, preparations; Meat, pork
Rice	Rice – total (Rice milled equivalent); Bran, rice
Sorghum	Sorghum; Flour, mixed grain; Grain, mixed
Soybeans	Oil, soybean; Soya sauce; Soybeans; Cake, soybeans
Sugar	Sugar beet; Sugar Raw Centrifugal; Sugar refined; Sugar, nes
Tobacco	Tobacco, unmanufactured; Tobacco products nes
Wheat	Wheat; Bran, wheat; Buckwheat; Flour, wheat

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